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Research on Contested Ground: Women, Mining and Health

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The women involved in the Labrador West Project: Left to right: Cathie Robichaud, Frances Fry, Noreen Careen, Jenny Robichaud, Catherine Coumans. Photo courtesy of Cathie Robichaud.

Researching health impacts of mining on women living in mining towns is fraught with social and methodological complexities. Mining is the primary source of income in a mining town and usually strongly supported politically. While women themselves are less likely to be employed in the mine, they are related to men with jobs in the mine. Women are frequently in a marginal economic and social position in mining towns. These factors limit the likelihood of finding funding and political support for a large-scale health study and inhibit access to information and participation of women in research focusing on potential health impacts from mining. Community-centered and participatory research methods are relatively inexpensive and can overcome barriers women may have to participation since both the focus population and the researchers are women from the mining community. Community-centered research can potentially enhance the level of knowledge about the impacts of mining on women's health and develop the capacity of women in mining communities to protect themselves and their families from the effects of mining. Methodological considerations related to community-centered research and its alternatives, are explored in this paper in the context of a research project in West Labrador.

In 2004, MiningWatch Canada partnered with two women's groups in the remote mining communities of Wabush and Labrador City (together known as Labrador West) to consider the health implications, for women, of living in a mining town. The Labrador West Status of Women Council and the Femmes francophones de l'Ouest du Labrador were interested in a community-centered participatory approach to better understand, document and communicate the health concerns of women in Labrador West. The interest of MiningWatch Canada in the project was triggered by the observation that it is most frequently women who express and take action on health issues. This finding is supported by Statistics Canada, which has noted that women tend to be the guardians of health for their families and have tended to be more concerned about health than men (Statistics Canada, 2001). Women

> Many people expressed their gratitude that the two Women's Centers have undertaken this Project, claiming "it is long overdue."
>
> *Effects of Mining on Women's Health in Labrador West,* p. 65.

also make up the vast majority of health sector workers (Statistics Canada, 1996).

As we prepared to scope the main health issues experienced by women in the community, we identified three goals for the project: to stimulate dialogue among women on the perceived impacts of mining on women's health in Labrador West, to document the findings of these discussions, and to present these findings to the wider community. Additional research activities completed by the Labrador West team included an historical review of mining activities, searches on documented health and environmental impacts from the mines in the region, and limited independent environmental (air, soil, and water) sampling.

We adopted the holistic definition of health that is used by the World Health Organization (WHO). The project aimed to treat health not merely as the absence of disease, but as the complete social, psychological, spiritual and physical well-being of a person, with a focus on the individual's own views of their well-being (WHO, 1996). Ultimately, one of the limitations of this project was that it did not address the spiritual well-being of women in Labrador West.

Although this approach to exploring community health concerns is well supported in practice and in the literature on community-centered health research (de Koning et al., 1996; Lebel, 2003; Mergler, 2001; Nichter, 1984; Seeley et al., 1992; Whyte, 2001), a number of concerns arose early in the project. These concerns are:

1. If the Labrador West project was not to be a large-scale health study carried out by health professionals, how should it be described to the community and what would be the basis for legitimacy of the project's findings?
2. If the findings were to indicate a need for further study, what kind of study should that be? In addition to unease about legitimacy, often expressed as the likely need to respond to critics, was a concern that the project may raise awareness about potential health impacts from mining without being able to be definitive about the link between potential sources of ill-health and the actual health problems experienced by community members.

This paper provides an overview of the methodology, process, and some findings of the project and explores the possible models for a follow-up study in Labrador West, including health risk assessment, epidemiological study,

and community-centered health study. An argument is made for the validity and effectiveness of scoping a community health study through an exploration of perceptions of health and perceived impacts on health as experienced and expressed by community members themselves.

Background

In preparation for the Overburdened project, MiningWatch Canada commissioned a review of epidemiological, toxicological, and community-based literature that examines the effects, both toxicological and social, of mining on women's health (CCSG Associates, 2004). The review found that little is known about the toxicological effects on women of exposure to common mining related minerals and metals. Women may face unique impacts due to specific physiological changes related to pregnancy, lactation, and aging, all of which may facilitate the release of metals that are stored in bone into the blood stream causing health problems to either the woman or a foetus (CCSG Associates, 2004). This lack of data provided new spurs to the Overburdened project.

Following a visit from staff of MiningWatch Canada and a focus group meeting with community women organized by the Anglophone and Francophone women's centers, the project was launched.

- Key audiences were advised of the project, including mine and union staff and community representatives.
- Key previous studies were identified and attempts were made to gather information and documents from government officials, union representatives and health associations in the province.
- A technical advisory team was established.
- Following a community-centered research workshop with MiningWatch Canada staff, a questionnaire was developed for administration to 10 health professionals.
- An interview guide was created for interviews with 29 women (10 Francophone and 19 Anglophone) from 10 locations in Labrador West.

As community interviews were underway, Susan Moodie of CCSG Associates visited Labrador West to provide training on community monitoring and collected water, soil, vegetation, and dust samples. Significantly, the mines were both closed due to a strike at this time. The CCSG report and

the final reports of the project were presented at a well-attended community meeting in Labrador West on February 15, 2005.

Broad themes related to women, mining, and health were identified in early open invitation meetings and workshops, and the themes were used to develop the community questionnaire. Discussion was intentionally structured to move from the "known" to the "less well known" health issues. This meant beginning with sources of ill-health that women felt they understood well (particularly the social and mental issues) and progressing to sources of ill–health that they suspected and worried about but did not feel they understood well (particularly related to air- and water-borne emissions from the mine that leave the mine site, mine waste, mine contaminants, and potentially related toxicology). This approach assured those present that by the time the less well known issues were discussed, the group was comfortable enough to express their lack of knowledge, to question why they did not know what might be in the air and water emissions from the mine, and to express interest in learning more about these sources of contamination.

Living in the Towns that Iron Ore Built

Communities in Labrador West exist only because of the ore bodies below and near them. Exploration of the sub-arctic heartland of Labrador dates back to the 1860s. The Iron Ore Company of Canada (IOC) was established in 1949 after the merger of several companies and is currently owned by Rio Tinto Ltd (58.72%), Mitsubishi (26.18%), and Labrador Iron Ore Royalty Income Fund (15.1%). The IOC iron ore mine started operations in the newly incorporated "Local Improvement District" named Labrador City in 1962, after appointing a board of directors to manage the settlement's affairs. The neighboring Scully iron ore mine in Wabush shipped its first iron ore in 1964 and the town was incorporated in 1967, after the mine also appointed a chairman and a board of directors to govern the settlement. Wabush Mines is jointly owned by Stelco Inc. (44.6%), Dofasco Inc. (28.6%), and Cliffs Mining Company (26.8%): their wholly owned subsidiary manages the mine.

Both mines continue to rely on a 61 km rail link that was completed in 1960 linking the mining towns to the 573 km main rail line running from the mining town of Schefferville, Quebec to the harbour city of Sept-Iles, Quebec on the St. Lawrence Seaway. This railway, completed in 1954, was the first modern form of land transportation into the rugged region, preceding road access by decades. In 1960, the first commercial flights brought families

into the newly forming mining towns in Labrador West. Until this time, the area is believed to have been inhabited by Nascopi indigenous people who were displaced by the mines and the influx of mine workers and their families (Labrador West Status of Women Council et al., 2004). By 1981, when both Wabush and Labrador City officially became towns and elected town councils, IOC was still paying a minimum of 75% of the total budget of the town (Gammage, 2004).

Everyone is in some way or another implicated in the business of the mines, as illustrated by the size of the workforce relative to the population: currently IOC employs approximately 1,250 people and the Scully Mine employs approximately 375 people. Labrador City and Wabush currently have populations of approximately 9,638 and 1,894 respectively.

These towns exemplify many of the conditions that are typical for single industry towns in Canada (Kuyek and Coumans, 2003). The remote sub-arctic area remains rugged, wild, thinly populated, and, until the mines arrived, the towns had no modern communications or transportation systems. The mining companies originally supplied all of the amenities from sewage to recreational facilities that made the towns livable. Built in the material of the time, most of the company houses still have the asbestos siding. The mining companies made it possible for the workers and families to leave Labrador West by train and plane for holidays, family occasions, and to study. Importantly, the women involved in the "Overburdened" project made it clear that over time the mines have increasingly devolved responsibility for the upkeep of the towns to the province and have cut back the special considerations given workers and their families with respect to free or cheap travel by rail or plane.

Women's Health Concerns

The focus group meetings and Community Centered Research workshop, as well as the random interviews conducted by the Labrador West women, all clearly indicated that mental and social health concerns of community women are perceived to be closely related to the circumstances that characterize living in a remote mining town. In particular, isolation, economic uncertainty, living in a "man's town," and shift work are associated with many of the social and mental ills experienced by women in the community.

Isolation was commonly expressed by Labrador West women in terms of living without extended family nearby. Distance from extended family was frequently discussed in terms of the high costs associated with train and air

travel out of Labrador West. Women talked about the family functions they had missed, from simple birthdays to funerals of loved ones, as a result of prohibitive costs associated with travel. They also talked about not having extended family, especially parents, nearby to help with childcare and of "losing" their children who eventually leave Labrador West for higher education. Isolation was also linked to long winters. Addictions and depression were common health concerns the women related to isolation.

Economic uncertainty was directly related by women to the precarious nature of dependency on a single industry. During a mapping exercise, the now former neighboring town of Gagnon was extensively discussed. Gagnon used to be a mining town, but when mining ended some years back the entire town was dismantled and the site has now largely been reclaimed by nature. As Gagnon lies on Route 389, the main road out of town, it was described as a constant reminder of the fact that the livelihoods and very existence of the Labrador West towns are essentially transient, their fates linked to the continued operations of the mines. In addition to nature's inexorable reclamation of Gagnon, a recurring reminder of economic dependency on the Labrador West mines is associated with periodic strikes at the mines, leading to immediate lay-offs in the town's businesses, stores, restaurants, and other service industries, where women tend to work. Both IOC and Wabush miners went on strike during the course of the research project with an immediate impact on the work of many women in the towns. Women related depression, worry and a sense of transience to the economic uncertainty of living in a town built by mining.

Indeed, the town may wither when the reserves of the two mines deplete. The total resources at the IOC mine are estimated at 5.5 billion tonnes of which 1.4 billion tonnes are proven and probable reserves and 4.1 billion tonnes are indicated and inferred reserves. Annual production is in the 35-38 million tonnes range. It is commonly held by people in Labrador that IOC could continue for another 50 years and that the timeline on Wabush is much shorter and more uncertain.

"It's a man's town" was a common catch phrase used by the women to describe a range of issues that they felt impacted on their own well-being. Fundamentally this phrase reflects the historical fact that it is "men's work" — the work of primarily male explorers and miners — that lies at the core of the founding and existence of the community. More immediately, women noted that the "best" jobs in town, meaning good salaries, unionized, full-time, relatively secure, with benefits and pensions, are the jobs associated

with the mines and these are still mostly held by men. Only about 43 women work at IOC and 27 women work at the Scully Mine (Labrador West Status of Women Council et al., 2004). Women explained that the jobs most women hold in the towns do not reflect their education, are part-time, non-unionized, and lack benefits or pensions. The repercussions of this reality are that women are more often than not financially dependent upon men, financially and legally vulnerable in the case of separation, and generally do not feel their work is valued as men's work is.

Women also noted that men's buying power is reflected in the number of "toys" that men in the town tend to have (planes, SUV's, snowmobiles). These not only determine the visual landscape of the town but also create competitive pressure to buy and display these prestige objects, leading to stress related to indebtedness. Women expressed concern related to temporary contractors coming in to work in the mines. Such workers also tend to be men, and it appears that their presence is related to higher than usual levels of sexual assaults. Women linked low self-esteem, cycles of suicide, depression, addictions, and sexual and physical violence to their inferior economic status in a mining town where the work of men is highly visible in the mines that tower over the towns and drive the economy.

Finally, women noted that shift work in the mines overwhelmingly determines social life and family life in Labrador West. This was one of the most frequently mentioned topics expressed under the category of social and mental health impacts from living in a mining town. Shift work was seen as the primary source of disruption of family time, serving to interrupt meals together, time with children, time with partners, and social engagements. Shift work was pegged as a major cause of marital and family discord, dysfunction and breakdown. It was also noted as one of the main hurdles for women in considering jobs at the mines, as shift work is incompatible with childcare.

Water and Air

There are two main sources of environmental contamination related to the mines in Labrador West. Air emissions include dust, diesel emissions and contaminants from the mines' stacks, such as carbon monoxide, sulphur dioxide, oxides of nitrogen, and volatile organic compounds. The focus here will be on dust. Water contamination mainly takes the form of impacts on lakes from waste rock, tailings, and process effluent. Additionally there may be water and air contamination from spills at the facilities and along the transportation routes.

Air

A visitor to Labrador West immediately becomes aware of the "dust" that almost continuously clouds the air and coats cars, lawn furniture, and laundry in the towns. As one women noted: *"you cannot leave anything outside for an hour or it will become covered in dust."* The dust also penetrates homes. Women noted that indoor windowsills are in constant need of cleaning. The women identified two kinds of dust, one being somewhat grey and the other blacker with sparkly pieces in it. Dust was identified as a dual health hazard. From a physical health perspective, women were concerned about what chemicals may be in the dust and what effects breathing the dust might have on their lungs. The constant onslaught of dust was also identified as a mental health problem as women felt the dust was oppressive.

There are a number of potential sources of air contamination from the mines: the exposed earth of the mine pits themselves; the processing of the iron ore, which involves blasting, crushing, chemical treatment and, in the case of IOC, "pelletizing" which creates stack emissions. In the case



This picture is of mine tailings from the Iron Ore Company of Canada in a lake in Labrador West. Photo courtesy of Cathie Robichaud.

of Wabush, drying concentrate creates emissions through four dryer stacks, and the exposed waste rock dumps (waste from clearing earth and blasting) and tailings (very fine crushed waste rock material left over after the iron has been extracted). The Scully Mine in Wabush uses a wet grinding process and magnetic separation for extracting the iron ore from the crushed rock, whereas IOC also uses a chemical flotation process. In 1996, IOC replaced two dry grinding mills with a new wet mill. Wabush sends its concentrate to Sept Iles, Quebec for pelletizing and shipment whereas IOC processes some of the concentrate into pellets in Labrador West and then sends pellets and concentrate to Sept Iles for transportation to markets.

Mine workers and residents of Labrador West expressed concerns about high levels of dust in the workplace and the towns as early as the 1960s and 1970s. It appears that the first air monitoring study was conducted in 1978 (CCSG Associates, 2004). This study found that total suspended particulate matter frequently exceeded proposed provincial standards (CSCG Associates, 2004: 18). In 1980, the Government of Newfoundland and Labrador commissioned Memorial University to conduct a dust and related health study focusing primarily on mine employees (Memorial University, 1982). The researchers identified 14 cases of pneumoconiosis, a non-cancerous but nonetheless serious accumulation of dust in the lungs that leads to scarring, in the Scully Mine workforce alone. The researchers concluded: *"The appearance of pneumoconiosis at this relatively early point in the life of the mining operation, approximately 15 years, is a matter of concern."* Subsequent studies have continued to record unacceptable levels of total suspended particulate and of respirable particulate matter. Fine particulate matter can be breathed into the lungs and cause lung disease; it is measured in two sizes: less than 10 microns and less than 2.5 microns. Our study lumps the two sizes as one category of respirable particulate matter. The National Pollutants Release Inventory for 2002 found that IOC released 3130 tonnes of respirable particulate matter, ranking the mine 5th out of 1056 sites tested nationally.

The findings of the Labrador West women's community survey clearly indicate community concern about the physical health effects of dust (Labrador West Status of Women Council et al., 2004). "Breathing problems" in general, are a frequently named health issue although women also identified specific respiratory illnesses of concern; asthma, silicosis, pneumoconiosis. Allergies are also frequently mentioned when women talk of the dust.

The air sampling conducted by CCSG Associates was done under unusual circumstances as the mines had been closed due to a strike for almost two

months and townspeople noted the marked reduction in dust levels. The sampling was done in September 2004, as opposed to the height of summer when more open windows may further affect indoor air quality, and there was scattered rain throughout the sampling period. Nonetheless, of ten sites sampled, two locations in Wabush had elevated total particulate matter and two in Labrador City had elevated respirable particulates, one being the lobby of the hospital. The CCSG Associates report concludes that the *"dust analysis for total and respirable particulates indicates results with some cause for concern."* Levels are gauged against those defined by the Canadian Occupational Safety and Health Administration Guidelines and the American Conference of Government Industrial Hygienists Guidelines.

> Lives have been lost due to lung disease. What is being done to stop this problem? How are the mines, unions and municipalities taking responsibility?
>
> *Effects of Mining on Women's Health in Labrador West,* p. 68.

Water

Both the Scully Mine in Wabush and the IOC mine in Labrador City have disposed of their mine waste (tailings and process effluent) into nearby lakes since the start of operations in the 1960s. This disposal has always been unconfined, in other words, the waste and its leachate is free to migrate through the lakes and into connected water systems.

Section 35 of the Fisheries Act (which predates these two mines) contains prohibitions against the destruction of fish habitat, and section 36 of the Fisheries Act contains prohibitions against the release of "deleterious substances" (meaning harmful) into "waters frequented by fish." On the basis of not destroying fish habitat, these lakes, which both contain fish, should never have been used as a tailings disposal site. Nonetheless, both mines received permits for the disposal. In 1977 the Metal Mining Liquid Effluent Regulations (MMLERs) were promulgated under section 36 of the Fisheries Act. The MMLERs defined "deleterious" by setting limits on certain metals and on Total Suspended Solids (TSS) in effluent to be deposited in a fish habitat. As TSS were not to exceed a monthly average of 25 mg/l, and tailings are

many times that amount, this should have put an end to the tailings disposal into lakes at Labrador West in 1977. But again, the disposal was allowed to continue. While Environment Canada was not questioned on this point, in other cases of existing mines that were out of compliance with new regulations, there has frequently been a "grandfather clause" that has allowed these mines to continue operating out of compliance with the new regulations.

The MMLERs were updated in 2002, and renamed the Metal Mining Effluent Regulations (MMERs). The MMERs do not allow for the unconfined disposal of tailings into lakes and require all existing facilities using lakes to come into compliance. IOC and Scully Mine were granted a "Transitional Authorization" until December 6, 2004 in order to come into compliance. Both mines (as well as one other mine in Canada) have recently been granted an additional (final) Transitional Authorization for 30 months to come into compliance with the MMERs. During this 30 month period IOC and Wabush may be out of compliance with the MMERs on levels of TSS only. They must be in compliance with respect to metal levels.



One of the open pits at the Iron Ore Company of Canada mine in Labrador West. Photo courtesy of Cathie Robichaud.

Tailings and other mine effluent have been released into the environment for a very long time in Labrador West. It was clear that many women were not sure where the tailings were deposited, nor what kind of waste this was and what kind of impact it might have on fish and human health. According to one woman's husband, many people do not fish in waterways that are connected to lakes where tailings and effluent are released. Focus group participants agreed that they should understand the nature of the tailings and their impact better. Women were also quite concerned about possible impacts from dust landing on the lakes from which they receive their drinking water.

Due to the strike and picket line, CCSG Associates was not able to sample the lakes that are used for tailings disposal, but other nearby lakes and the drinking water facilities were sampled. Aluminum was found to exceed Canadian Council of Ministers of the Environment Guidelines in all four recreational lakes that were sampled. Wabush Lake, which contains some tailings from IOC, had extremely high values for aluminum. Nickel and iron also exceeded CCME Guidelines in Wabush Lake. Wabush Lake far exceeded the other non-drinking water lakes that were sampled for these three metals. While metals in the two lakes used for drinking water were within limits, a water tap filter that had been used for three months was tested and found to have high levels of aluminum, copper, and iron (CCSG Associates, 2004: 6-7).

Unanswered Questions

While most women in the town were very clear and articulate about the social and mental impacts on health related to living in a mining town, they were much more uncertain about possible off-site contamination from the mines. They questioned what kinds of waste and pollution the mines produce, where the waste goes, what may be in the dust and water, and the effect of these on their health.

Even though community experience and knowledge was clearly supported by past studies and by the sampling conducted by CCSG Associates, the women found that many questions remain. With regard to physical ailments, there were a significant number of women who mentioned respiratory problems and diseases of the digestive system as key concerns. A community health survey conducted in 2001 also found that the highest percentage of hospital admissions between 1994 and 1999 was for diseases of the digestive system. Research done by the women's groups found that as far back as 1980,

pneumoconiosis among workers was a reality. However, few women who were interviewed in the course of this project had ever heard of Memorial University's 1982 Labrador West Dust Study, which identified 10 new cases of pneumoconiosis out of a total of 14 cases reported. There has been very little information on the topic of dust and its consequences provided to the community by the mines, the municipal officials, or the province since the 1982 study. Women raised questions about current levels of lung disease among workers and the community and about whether the many recommendations that came out of the Labrador West Dust Study had been implemented. Some of the women also noted that it would be important to track retired workers. These workers most often leave the community, so that any lung disease they may develop would escape notice in Labrador West.

> People in mining communities have many fears: what is really in the air and water and who can be trusted to give accurate information? Those with strong opinions are afraid to speak out, for fear of losing their jobs.
>
> *Effects of Mining on Women's Health in Labrador West,* p. 66.

It became very clear that the uncertainty and worry about what may be in the air, the water and the soil was itself a major contributor to dis-ease and ill-health. In one of the focus group meetings one of the women noted that if the mines, the municipality and the government truly wanted to contribute to the health of the community, then one way they could do so quite readily would be to provide more and better information to the public regarding off-site emissions from the mines and regarding the health of mine workers.

> Until we know for certain that there are no contaminants in the water, soil or air, people's stress levels will remain at a level that will compromise their immune systems.
>
> *Effects of Mining on Women's Health in Labrador West,* p. 67.

This brings us to another critical finding. It became very clear in the course of the project that copious amounts of data on waste streams and

off-site emissions from the mines are regularly being gathered by the mining companies and routinely provided to provincial and federal government departments. But this data is not shared and interpreted for the townspeople, and it is difficult to get access to, as discussed by one woman: *"Getting information from the mining companies, health professionals and government departments was more difficult than we imagined."* In one case, the women were told by IOC that the company would not release some of its modeling data but that the women could ask the province for the data. The government of Labrador and Newfoundland required an Access to Information request for the data, as well as for air monitoring data from 1993-2003. They were told that the costs of providing the information would run in the hundreds of dollars and that all information may not be released (Labrador West Status of Women Council et al., 2004: 64).

> Communities are not always aware about studies done and their results. We found out by accident, about a cancer study done, showing the actual incidences of cancer in Labrador West between 1980-2002. Without the right contacts, you will not get the right information. It really is who you know.
>
> *Effects of Mining on Women's Health in Labrador West,* p. 66.

Where To From Here?

> With any awareness comes a responsibility to make change.
>
> *Effects of Mining on Women's Health in Labrador West,* p. 65.

The final report of the Overburdened project (Effects 2004) was launched at a community meeting on February 15, 2005 and received a great deal of community interest (*53 North*, Feb. 18, 2005). The report calls for greater transparency, accountability, and responsibility particularly from industry and government. The executive summary outlines specific recommendations for action by various parties.

No doubt there will be detractors. Experienced community researchers suggest common lines of attack on community-centered research projects can be multiple. For example, Love Canal's famous advocate, Lois Marie Gibbs has experienced the following criticisms of community research:

- The researcher is not an epidemiologist, thus it's not a scientific study.
- The people who conducted the study are people with a vested interest in the outcome and bring in bias.
- The population is sensitized and thus over-reporting their health problems.
- Not enough people were interviewed to make it a valid study. You must interview 95% of the population.
- The population is too small to get a statistically significant difference.
- There is no "control" population for comparison.

These criticisms are based on a comparison of community-centered participatory health research with traditional epidemiological studies and health risk assessments. But rather than recognizing the inherent differences and concomitant strengths and weaknesses of each of these methodologies, this critique is based on a prioritization of the preoccupations of traditional health study methodologies, which may not be a primary concern in a community-centered health methodology. As these critiques illustrate, however, researchers, whether community based or outside experts, rarely approach a study without bias and any population subjected to a health study is "sensitized." Furthermore, the debate about necessary population size, statistical significance and the value of control populations is ongoing among the theoreticians of traditional health studies. And among the practitioners of traditional health studies there is a recognition that the methodological strictures of epidemiological and health risk assessment studies limit the populations they can study and the types of illnesses about which they can be definitive.

In light of these considerations, there is no doubt that the value of the Overburdened project lies, in part, in the fact that it was readily accessible to community women. It did not contain *a priori* restrictions on what could be discussed or explored and it raised awareness and a desire to better understand the issues of mining and community health on the part of many participants. The project also increased community capacity for research and data gathering and expanded contacts of the women who participated with government, union and industry representatives who have access to studies

and information that has not been made available to the community. Finally, it helped to provide focus on the issues, questions and data gaps that need to be followed up on.

> We have learned who to call, where to go for information, who can be trusted and who can not.
> *Effects of Mining on Women's Health in Labrador West,* p. 67.

There were particular areas where data from past studies, from women's own experience, and from the sampling complemented each other. In particular, it is clear that more work needs to be done to understand the physical and mental health implications of the dust in Labrador West for the community and for workers.

The question now is what kind of follow-up would be appropriate. It is worth expanding briefly on the discussion above of epidemiological studies and health risk assessment methodologies.

Epidemiology

An epidemiological study identifies a hazardous material, or exposure, which reaches the population through a single medium — air, water, or food - and searches for an adverse health effect in larger than expected numbers in the population (Bertell, 1994). Epidemiology has also been described as a "natural experiment" (Ozonoff and Boden, 1987) because, unlike in controlled laboratory experiments, it attempts to identify causes and effects in a wide open natural environment in which many influences may impact on the study. These influences include variables such as exposure times of subjects, personal habits of subjects, and physical differences between people creating different responses to similar exposures.

It is important to take a hard look at the pitfalls associated with an epidemiological study. In order to minimize the impact of these "interfering" influences on the study, epidemiologists have to study large populations. This makes epidemiological studies time consuming and costly. It also means that this methodology cannot be used in small population groups.

An epidemiological study is beyond the financial and skills capacity of most communities to carry out. They must rely on outside "experts" to undertake the research for them, which can, in turn, alienate them from the

process. For this reason relevant community-specific information that may be critical to the study is often not communicated to the outside experts.

Other problems with epidemiological studies are that they cannot capture important but sub-lethal health affects (such as reproductive problems), or chronic or cumulative health effects (such as immuno-compromisation or chemical sensitivity), as they usually rely on identifying terminal illnesses to "prove" a health effect from a particular contamination source (Bertell, 1994).

Finally, given the methodological limitations associated with epidemiological studies, more often than not the findings of these studies are that there is "no evidence" to link a particular source of contamination to ill health in the community. An extreme example of a case in which the results of epidemiological studies could be used by public health officials to claim that a connection could not be made between a contamination source and health impacts is the case of Love Canal's toxic waste site contamination in the United States (Ozonoff and Boden, 1987). Eventually, the relationship of the waste to ill health could no longer be denied, but epidemiological methodology maintained enough "uncertainties" to allow officials to deny a scientific basis for a link. New forms of "popular" epidemiology are flourishing — see Haley in this volume.

Health Risk Assessment

Health risk assessments are based on two concepts, "hazard" and "exposure." "Hazard" is the intrinsic toxicity of the material (usually based on experiments on laboratory animals). "Exposure" is the dose delivered to a human being (O'Brien, 2000). Based on these two pieces of information, a risk manager will determine whether an exposure is "acceptable."

Assumptions embedded in the method are rarely made explicit, such as the notion that there are acceptable trade-offs between risks and benefits, between, for example, human exposure to a toxin and economic benefit to that person or population. Levels of exposure are weighed in assessing the risk versus the benefits. In other words, health risk is not absolute; it is relative to a perceived benefit associated with the very toxin that is threatening health. That tradeoff is obscured in the scientific process, and open and democratic dialogue about risk acceptability is not encouraged. Health risk is also relative to a current understanding of specific potential health impacts (diseases) and how these are ranked in terms of acceptability or severity (for example, cancer is unacceptable but asthma is manageable, and so more acceptable).

Health risk assessment also assumes that it is possible to "know enough about the hazards of, and exposure to, a particular chemical or activity to enable calculation of the risks in a reliable manner" (Tonkes, 2001: 100; Thornton, 2000). However, levels of acceptable exposure are associated with a hypothetical human being. In reality, the same level of exposure in one person may be more toxic than in another. Furthermore, the complexities of the environmental variables in which exposure takes place are enormous. Tonkes (2001: 100) concludes:

> The implicit and operational limitations, uncertainties and indeterminacies of the description of ecosystem pathways and interactions can result, in turn, in the transmission of substantial uncertainty and inaccuracy to the analysis of the associated risk.

Increasingly, health risk assessment is coming under attack as a convenient tool of the polluters. Given the number of variables in a health risk assessment, and the often hidden assumptions that inform these variables, it is argued that it is all too easy to conduct a health risk assessment and arrive at the conclusion that a risk is 'acceptable" or "negligible" (O'Brien, 2000: 27). Just as there are efforts to rework epidemiology to make it more acceptable, so alternatives to risk assessment have emerged, but are beyond the scope of this paper. Examples include the precautionary approach of "hazard assessment" and "alternatives assessment" (O'Brien, 2000).

The Thorny Issue of Causality

Too often, epidemiological studies and health risk assessments come to the conclusion that there is "insufficient evidence" to prove a causal link between an environmental toxin and a particular health problem in a population. In other cases there is denial that a specific source of contamination even has the potential to cause ill-health, such as in the case of chrysotile asbestos. Given the recognized complexities that cloud building strong causative links between a contamination source and a health effect, there must be new ways identified to build the case for a link based on "weight of evidence" and the precautionary principle.

This problem was tackled by Sir Austin Bradford Hill in 1965 (Lemen, 2004). Hill identified nine criteria for determining a link between a specific substance and a negative health effect. These criteria are known as:

- *Strength of Association* — This is the strength, reflected in studies, of an association of the particular contaminant and a particular health ef-

fect (for example in comparison to populations that have never been associated with that contaminant).

- *Temporality* — This time element requires the cause, such as the exposure to the contaminant, to occur before the health effect.
- *Biologic gradient* — The research must observe an increased dose of the contaminant resulting in an increased negative health response.
- *Consistency* — A proposed health effect can be observed repeatedly under different circumstances.
- *Specificity* — Each cause must have a single effect. This can be difficult to establish because many contaminants cause more than one health problem.
- *Biologic plausibility* — The theory of causation fits with known biological mechanisms. In other words, it is plausible, given human physiology, that a given contamination source would have a pathological impact on the body.
- *Coherence* — This criteria asks whether the presumed link between the contaminant and the disease is consistent with what is already known about the disease.
- *Experimental evidence* — This results from controlled studies, such as on laboratory animals.
- *Analogy* — This questions whether studies have established a link between a similar type contaminant and a similar disease.

If a specific substance meets the nine criteria set out by Hill, then, he argues, a cause and effect relationship between a particular substance and a health effect must be accepted. But Hill also recognized that it may be impossible to apply all nine criteria in certain cases and he insisted that it is not necessary for all nine criteria to be met to establish causation through "weight of evidence." Dr. Richard Lemen (2004) recently applied Hill's model to the question of whether a contaminant, chrysotile asbestos, can cause lung cancer (mesothelioma). Industry and government representatives argue that chrysotile asbestos can be used safely. Lemen concluded that chrysotile meets Hill's nine criteria and can induce lung cancer.

Community-Based Health Study
A possible next step for Labrador West?

Given the methodological concerns associated with epidemiological studies and health risk assessment, a full-scale Community-Based Health

Study poses a viable alternative. Thanks to pioneering work done by individuals such as Dr. Rosalie Bertell, this approach has been refined and systematized (Bertell, 1994). Bertell's results have withstood the scrutiny of a Congressional inquiry forcing the US government to pay large sums in compensation to Marshall Islanders affected by nuclear testing. Bertell has used her methodology to study uranium exposure in Aboriginal communities, conducted health profiles of multiple Aboriginal communities, and reviewed the health problems of people living near US Air Force bases, among other studies.

Bertell identifies a process for Community-Based Health research that begins with processes rooted in community actions, much like those taken in Labrador West. She recommends work that triggers sharing knowledge and identifying data sources and local resource organizations, agencies, or individuals. She notes that people may come together as a result of a high incidence of a particular disease or a prevalent contamination source that is a concern, such as in the case of the dust in Labrador West. She contends that it is not the responsibility of community members to prove a link between a contaminant and health effects, but to ask critical questions and raise the possibility with local authorities.

The next step is to establish a community health profile. Bertell warns that this is not an inexpensive proposition. For a community health survey of 100-200 households she estimates a cost of $35,000-50,000 in North America. She also advises communities to enlist the aid of professional help in designing and executing the health survey, preferably a medical professional. The questionnaires Bertell has produced are elaborate (up to 40 pages) and colour coded to represent different types of information or informants. Bertell has prepared a basic health survey questionnaire, with up to 17 community health parameters, that is available through the International Institute of Concern for Public Health.

For Bertell, the goals of the exercise are varied. A community based health survey should raise awareness among affected people allowing them to act collectively to influence decision makers (such as elected officials) to address health concerns of the community. Her goal is also to have people identify ways that they can make personal changes in their lives to protect themselves. The survey can be used in Environmental Assessment Hearings and as a baseline against which to measure further environmental changes as an industry develops.

Conclusions

Researching the potential health effects on women from living in a mining town is necessarily contentious research that is subject to being opposed and contested by elected officials, union representatives, workers, mining executives and even potentially community women themselves. The women of the Femmes francophones de l'Ouest du Labrador and the Labrador West Status of Women Council experienced various forms of resistance to their project, for example, when they tried to access studies and reports held by the mines and provincial authorities. In a contested arena such as this one, the community-centered research approach was effective as it did not rely on political support or financial support from the municipality or the mines; it relied on long standing relationships of trust between the women doing the research and community women, and it was informed from the start by knowledgeable researchers who have lived in the mining towns for decades.

The project was successful in identifying key areas of concern that do need further investigation, as well as information gaps and key reports whose data and findings are not being shared with or adequately communicated to the community. The question of what kind of follow up study is needed, and is possible, must take the contested nature of the research topic into consideration. Methodologies that are not transparent, rely on assumptions that may not be acceptable to community women, or readily lend themselves to inconclusive results are not helpful. An expanded Community-Based Health Study, such as that developed by Bertell, provides a viable alternative that would build on the capacity developed by the women in this exploratory project and may not be cost prohibitive.

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